Helmut-Schmidt-Universität
Universität der Bundeswehr Hamburg
University of the Federal Armed Forces Hamburg

Fächergruppe Volkswirtschaftslehre
Department of Economics

Discussion Paper No.
August 2005 41

# Mobile Number Portability in Europe

Stefan Bühler, Ralf Dewenter
& Justus Haucap

# REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188



| 1. AGENCY USE ONLY (Leave blank) | 2. REPORT DATE | 3. REPORT TYPE AND DATES COVERED |
|---|---|---|
| | July 2005 | Discussion Paper |

**4. TITLE AND SUBTITLE**

Mobile Number Portability in Europe

**5. FUNDING NUMBERS**

**6. AUTHOR(S)**

Stefan Buehler, Ralf Dewenter, Justus Flaucap

**7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)**

UNIBW
University of the Federal Armed Forces Hamburg

**8. PERFORMING ORGANIZATION REPORT NUMBER**

**9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES**

UNIBW

**10. SPONSORING/MONITORING AGENCY REPORT NUMBER**

Discussion Paper No. 41, August 2005

**11. SUPPLEMENTARY NOTES**

Text in English, 20 pages, 32 references, 8 tables, 2 figures.

**12a. DISTRIBUTION/AVAILABILITY STATEMENT**



**12b. DISTRIBUTION CODE**

**ABSTRACT (Maximum 200 words)**

This paper examines the causes and effects of mobile number portability (MNP) and provides a survey of its implementation in Europe. We first examine the competitive effects and the costs of introducing MNP. Next, we discuss how to charge for MNP. We argue that a price cap regime starting from the average cost of porting is likely to provide appropriate incentives. Finally, we review the recent experience with implementing MNP in Europe. Differences in the speed of porting and porting charges appear to explain part of the differences in the use of MNP across countries.

**14. SUBJECT TERMS**

ISL, German, Mobile number portability (MNP), Mobile communications, Switching costs

**15. NUMBER OF PAGES**

**16. PRICE CODE**

| 17. SECURITY CLASSIFICATION OF REPORT | 18. SECURITY CLASSIFICATION OF THIS PAGE | 19. SECURITY CLASSIFICATION OF ABSTRACT | 20. LIMITATION OF ABSTRACT |
|---|---|---|---|
| UNCLASSIFIED | UNCLASSIFIED | UNCLASSIFIED | UL |

# Mobile Number Portability in Europe

Stefan Buehler*, Ralf Dewenter** & Justus Haucap**

July 2005***

This paper examines the causes and effects of mobile number portability (MNP) and provides a survey of its implementation in Europe. We first examine the competitive effects and the costs of introducing MNP. Next, we discuss how to charge for MNP. We argue that a price cap regime starting from the average cost of porting is likely to provide appropriate incentives. Finally, we review the recent experience with implementing MNP in Europe. Differences in the speed of porting and porting charges appear to explain part of the differences in the use of MNP across countries.

* University of Zurich and University of St. Gallen; Socioeconomic Institute, Blümlisalpstr. 10, CH-8006 Zurich. Fax: +41-1-634 49 07, email: sbuehler@soi.unizh.ch.

** Helmut-Schmidt-University, Department of Economics, Holstenhofweg 85, D-22043 Hamburg. Fax: +4940 6541 2042, email: ralf.dewenter@hsu-hh.de.

** Ruhr-University of Bochum, Department of Economics, Universitätsstr. 150, GC3/62, D-44780 Bochum. Fax: +49 234 32 14311, email: justus.haucap@rub.de.

*** We thank two anonymous referees, Bernhard Albrecht, Oliver Kaliski, Jörn Kruse, Scott Minehane; Alexander Zuser and participants at the 15th Biennial Conference of the International Telecommunications Society (ITS) at Berlin 2004 for most helpful comments and suggestions. We are also grateful to the numerous individuals and regulatory authorities who have responded to our survey on mobile number portability. Sandra Grunewald and Jutta Kehrer provided valuable research assistance.

# 1 Introduction

Traditionally, consumers of mobile telecommunications services were required to give up their number when switching providers. Consumers were thus hesitant to switch from the incumbent to competing operators, thereby inhibiting more effective competition in mobile telecommunications. Lately, the picture has changed dramatically, as mobile number portability (MNP) has been implemented in the European Union (EU) and many other countries around the world.

According to the EU's Universal Service Directive of 7 March 2002, which became effective on 25 July 2003, MNP means that customers are given the right to keep their mobile telephone number when switching between service providers. Under Article 30 of this Directive „Member States shall ensure that all subscribers of publicly available telephone services, including mobile services, who so request can retain their number(s) independently of the undertaking providing the service".[1] Similar approaches towards introducing MNP have been adopted elsewhere.

From a property rights perspective, the introduction of MNP reallocates the property rights in mobile telephone numbers from operators to consumers. The main rationale for this re-allocation is the enhancement of competition in mobile telecommunications. As the EU argues, "number portability is a key facilitator of consumer choice and effective competition in a competitive telecommunications environment" (see EU, 2002, p. 57). Accordingly, national regulatory authorities (NRAs) shall ensure that (a) charges for mobile number portability are cost-oriented and "that direct charges to subscribers, if any, do not act as a disincentive for the use of these facilities" (Art. 30 (2) Universal Service Directive), and (b) retail charges for MNP do not distort competition (Art. 30 (3) Universal Service Directive).

In this paper, we present a non-technical analysis of the causes and effects of MNP, and we review the recent experience gained with MNP in European countries. We start with a discussion of the competitive effects and the costs of introducing MNP (sections 2 and 3). Section 4 provides an analysis of appropriate charges for MNP, an aspect that has largely been ignored in previous literature. We then proceed to evaluate the recent experience with MNP in Europe (section 5). We offer concluding remarks in section 6.

# 2 On the Competitive Effects of MNP

## 2.1 The Case for MNP

The rationale of introducing mandatory MNP is simple: It is expected to bring about considerable benefits to consumers of mobile services (see, e.g., Ovum 2000). Adopting the classification originally proposed by NERA/Smith (1998), we briefly discuss five potential benefits of introducing MNP to consumers of mobile services (see Table 1).

With switching costs, customers that actually switch (and thus give up their number) incur a utility loss. Also, switching costs induce some consumers to stick to a provider which is not their preferred choice. Introducing MNP benefits both types of consumers: Consumers who switch even in the absence of MNP can retain their number (benefit 1A), and consumers who switch only with MNP are more likely to obtain services from their preferred operator (benefit

---

1 Directive 2002/22/EC of the European Parliament and of the Council of 7 March 2002 on universal service and users' rights relating to electronic communications networks and services (Universal Service Directive), Official Journal of the European Communities, 24 April 2002, L108/51-77.

1B).[2] While MNP thus benefits consumers that actually switch, there are also benefits to non-switching consumers resulting from more intense competition among providers of mobile telecommunications services (benefit 2).[3] Furthermore, introducing MNP benefits consumers who place calls to ported numbers (benefit 3). Without MNP, these consumers have to update their address books, may be unable to call a particular user, etc.[4] Finally, introducing MNP benefits mobile customers because of the reallocation of property rights (benefit 4). The fact that MNP reallocates property rights in telephone number is especially important for so-called vanity numbers. If customers advertise their telephone number, this increases the number's value and may be seen as a specific investment into the number's value. Hence, a telephone number's value is to some extent endogenous.[5] The incomplete contracts literature suggests that underinvestment results if the customer making the investment does not hold the property right in the number.[6] Hence, the reallocation of property rights strengthens the customers' investment incentive. This thickening of consumers' property rights benefits all consumers – whether they actually port their number or not. The *option* to port one's number is decisive here, and this option is given to every telephone user with MNP.

Table 1: Benefits of Introducing MNP

| Type of Benefit | Applies to | Benefit |
|---|---|---|
| 1A | Users who switch even without MNP | Avoided Costs of Number Change (e.g., informing users, missed calls) |
| 1B | Users who only switch with MNP | Benefits of moving to a more preferred operator |
| 2 | All Users | Intensified Competition |
| 3 | Caller | Avoided costs of finding changed numbers |
| 4 | All Users | Increased investment in number value due to re-allocation of property rights |

We now proceed to a more detailed analysis of the competitive effects of MNP, focusing on the elimination of switching costs associated with MNP.

---

2 In a model with differentiated products, this means that consumers can switch more easily to their preferred provider, so that an increase in allocative efficiency results (see, e.g., Buehler and Haucap, 2004).

3 See, e.g., Aoki and Small (1999); Galbi (2001), and Gans and King, (2001).

4 However, most cost benefit analyses have estimated this effect to be relatively small or almost negligible (see, e.g. Oftel, 1997, Schwarz-Schilling and Stumpf, 1999).

5 Some numbers that are easy to remember already have a high exogenous value. This is illustrated by the fact that in the Chinese province of Sichuan the telephone number 8888 8888 obtained a price of 2.33m yuan ($282,000) in an auction in August 2003. The reason is that many Chinese people consider the number eight to be lucky because it sounds similar to the Mandarin and Cantonese word for getting rich. So an eight-digit number containing only the number eight is considered especially auspicious (see BBC, 2003).

6 The classic reference is Grossman and Hart (1986). Haucap (2003) provides an application to telephone numbers.

## 2.2 The Effects of Eliminating Switching Costs

Consumers of mobile telecommunications services typically face switching costs which derive from the real and psychological costs that consumers confront when changing suppliers (see, e.g., Klemperer 1987a, 1987b, 1988, 1995). These switching costs are *endogenous* if they emanate from customer loyalty programs (such as *Deutsche Telekom's* so-called *Happy Digits* program) or contractual clauses that make the change of suppliers more costly (such as contract termination penalties). There are also *exogenous* switching costs resulting from the transaction costs associated with switching providers (e.g. for changing the network assignment of a given number). Introducing MNP eliminates at least part of these switching costs. In the following, we describe some important static and dynamic effects of introducing MNP.

### 2.2.1 Static Effects

Previous literature has mainly focused on the static effects of introducing MNP, largely abstracting from market entry and investment. In this section, we briefly survey some of the literature's key findings.

*Retail Prices*

It is well known that, in the presence of switching costs, firms may exploit their market power over captured customers. For instance, with linear retail prices, an incumbent firm benefits from a wedge driven between its price and the prices of new entrants, allowing the incumbent to charge a higher price than would otherwise be possible. To see this, suppose that the customers of an established provider $A$ face switching costs $S > 0$. Firm $A$ is thus able to charge a higher retail price than its competitor $B$ without inducing its customers to switch. That is, the customers of provider $A$ will switch only if $p_A > p_B + S$. Introducing MNP should thus be expected to reduce retail prices, benefiting mobile customers.

With nonlinear retail prices, introducing MNP is still likely to benefit mobile customers (provided they do not suffer from the so-called "customer ignorance problem"[7]). However, the argument is slightly more complex. Using a simple model with differentiated networks, Buehler and Haucap (2004) show that the incumbent's customers benefit from lower fixed fees with MNP, whereas competitors' customers suffer from higher fixed fees. Since the beneficial effects on the incumbent's customers dominate the adverse effects on the competitors' customers, the overall effect of MNP on mobile customers is positive.[8]

*Price Elasticities*

The above arguments suggest that it is more difficult to gain market share in the presence of switching costs, as undercutting needs to be more severe. Technically speaking, the firms' perceived price elasticity of demand is smaller, and equilibrium prices should thus be expected to be higher than with MNP. Moreover, the smaller price elasticity of demand helps to stabilize collusive arrangements (see Schwarz-Schilling and Stumpf, 1999), as the extra profits from deviating from collusive behavior will be relatively small.

---

7 We discuss the customer ignorance problem in more detail below (see section 3.2).

8 A referee correctly pointed out, though, that the overall effects on prices in a more general model are less clear, as MNP reduces the firms' possibilities to discriminate between on-net and off-net tariffs.

*Termination Charges*

The effects of introducing MNP on termination charges crucially depend on the occurrence of the "customer ignorance problem" (Gans and King, 2000). If customers can identify the network assignment of each individual number even after introducing MNP, termination charges should remain unaffected. However, if customers are no longer able to determine which mobile network they are calling when placing a call, termination charges are likely to increase. Intuitively, this follows from the firms' incentives to increase their charges when customers only take notice of average charges (see Buehler and Haucap, 2004).

*Market Shares*

In the presence of switching costs, the market shares of the incumbent and its competitor will typically be asymmetric. More specifically, the incumbent will have a large market share, whereas its competitor will have a smaller market share. In standard network competition models, introducing MNP will eliminate this asymmetry, as the competitor is no longer forced to offer a discount relative to the incumbent to attract customers, and market shares will thus be aligned. If the providers' profits are convex in own market share (as, e.g., in Buehler and Haucap 2004), introducing MNP will reduce aggregate profits. That is, the incumbent's loss is larger than the extra profit awarded to the competitor.

### 2.2.2 Dynamic Effects

In addition to static effects, introducing MNP will generate dynamic effects. In particular, MNP might affect entry and investment decisions, as we now briefly discuss.

*Entry*

We have noted above that, with switching costs, entrants have to price aggressively to steal business from the incumbent. Introducing MNP will alleviate the need to price aggressively, thereby facilitating entry. However, there may be countervailing effects. For instance, if incumbent mobile operators have a large captured customer base thanks to switching costs, they are less likely to fight entry by aggressively cutting prices due to the so-called fat-cat effect (see Fudenberg and Tirole, 1984). The net effect of introducing MNP on entry is thus ambiguous.

*Investment*

Introducing MNP is likely to affect the investment incentives of both incumbents and potential competitors. However, to the best of our knowledge, there is no systematic analysis of the effects of MNP on the service providers' investment incentives. Standard arguments suggest that introducing MNP will reduce the incumbent's incentive to make cost-reducing investment, as the cost-reduction applies to a reduced customer base. Conversely, the competitor's incentives to make cost-reducing investment should be expected to increase, with ambiguous net effect. The aggregate effects on demand-enhancing investment, such as infrastructure quality or product innovation, are even less clear.

### 2.2.3 Summary

Overall, the competitive effects of introducing MNP are fairly complex. MNP is likely to affect retail prices, termination charges, price elasticities, market shares, as well as entry and investment decisions. So far, it is fair to say that most analyses on MNP have supported the notion that, on the whole, MNP intensifies competition in mobile telecommunications. Available empirical evidence on the portability of premium rate numbers appears to support this conclusion (Viard, 2004). Yet, it is unlikely that introducing MNP reduces *all* prices. In fact, standard models suggest that handset prices will increase as the value of a captured customer decreases, whereas prices for mobile services will decrease as competition intensifies (Buehler and Haucap, 2004). Furthermore, the pro-competitive effects of MNP are likely to vary across countries, depending on the degree of competition achieved before introducing MNP.[9]

# 3 The Costs of MNP

Obviously, the introduction of MNP generates costs (otherwise, the decision whether or not to introduce MNP would be trivial). Generally speaking, we can distinguish between direct and indirect costs of introducing MNP.

## 3.1 Direct Costs

The direct costs of implementing and running an MNP system consist of

- Costs of developing and implementing a MNP system (set-up costs),
- Costs per actual porting process,
- Additional conveyance costs.

As we will further discuss below, the magnitude and structure of these costs depend heavily on the technical solution used to implement MNP. The set-up costs are the non-recurring costs of developing and implementing a particular MNP system. These costs include changeover costs which arise when changing from an existing to a new system (e.g. when changing from an on-switch to an off-switch solution, see Smith/Arcome/NERA, 1997, p. 62 f.). More specifically, set-up costs include costs for developing software, upgrading switch software, installing company procedural and operational methods, and developing an operational support system. These costs are fixed, that is, they do not depend on the number of actual portings or the traffic routed over a network. In general, these fixed costs are relatively high for so-called IN solutions (off-switch), while they are relatively low for on-switch solutions.

In addition to fixed set-up costs, there are variable costs associated with the porting process. These are mainly the costs of carrying out the porting, e.g. advising the customer, communications between the donor and the receiver network, administrative work related to

---

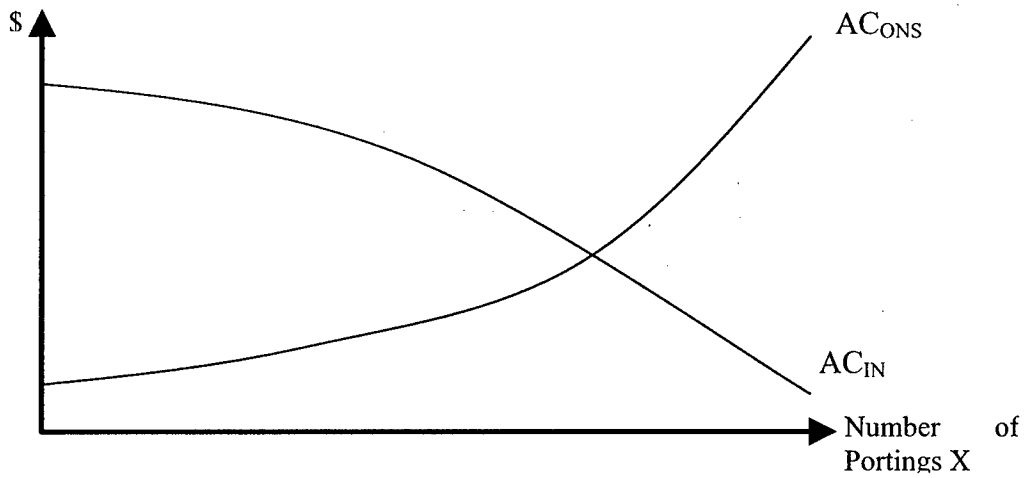
9 For example, a NERA/Smith study of the costs and benefits of introducing MNP in Hong Kong estimated the additional benefit from increase competition to amount to 1 Euro per customer over a period of 10 years, as competition was already quite intense even before MNP was introduced (see NERA/Smith, 1998). In contrast, Oftel (1997) estimated the additional benefits of increased competition resulting from MNP to lie around 69 Euros per customer over a 10 year period – quite a significant difference which is due to Oftel's assumption that competition would be significantly more intense with MNP than without MNP (see Oftel, 1997).

the number switch, and so on. These costs are essentially personnel costs, and they depend on the specific administrative and technical procedures put in place.

Finally, there may be conveyance costs, which also depend on the technical solution chosen to implement MNP. Since simple technical solutions (on switch) lead to an inefficient use of network resources, these costs are much lower with more advanced IN solutions (off-switch). With simple solutions, it becomes difficult to determine the exact costs of a connection, and the problem is exacerbated when the number of portings and networks involved is high. As a result, simple solutions for the implementation of MNP are usually regarded as inefficient temporary solutions at best (see Smith/Arcome/NERA, 1997, p. 67).

Comparing the direct costs of the various technical solutions, we note that on-switch solutions are characterized by comparatively low fixed set-up costs and high variable costs. In contrast, IN solutions have relatively high fixed set-up costs, whereas their variable costs are low. Hence, IN solutions are cost-efficient if the expected number of portings is relatively high, whereas less advanced solutions (such as call forwarding) are efficient as long as the number of portings is low. The stylized average cost function for these two technologies, on-switch (ONS) and off-switch (IN), are depicted below, as is the threshold number of portings after which an IN solution becomes more efficient than an on-switch solution.

Figure 1: Direct Costs of MNP using ONS or IN Technology




### 3.2 Indirect Costs of MNP

There are also indirect costs of introducing MNP, resulting from the potential loss in tariff transparency—an effect that has largely been ignored in the debate on MNP. The loss of tariff transparency results from the fact that MNP can make it more difficult for consumers to distinguish between different networks when placing a call. In the absence of MNP, consumers can usually distinguish between different mobile networks through the number prefix. When MNP is introduced, however, the number prefix no longer indicates the network assignment of a given number. Thus, if calling prices differ across networks, customers will be unaware of the exact charges for placing calls to mobile networks. As Ovum (2000, p.14/15) acknowledges in its cost-benefit-analysis of MNP in Ireland, "the first three digits of the called number no longer indicate the network operator of the called subscriber reliably.

Full tariff transparency is therefore lost and, unless prices change, callers end up paying a lot more than expected for certain calls. [...But] it is difficult to quantify these effects and we have excluded them from our cost benefit analysis."

In the academic literature, the "customer ignorance problem" has been explored by Gans and King (2000) and Wright (2002). These authors show that mobile operators may have incentives to increase their termination charges if consumers only take notice of average prices. Dewenter and Haucap (2005) provide empirical support for this finding, and Buehler and Haucap (2004) analyze the tradeoffs related to the introduction of MNP.

However, the loss of tariff transparency may be overcome. In Finland and Germany, for example, consumers can call a toll-free number to identify a particular number's network assignment. In Portugal, an acoustic signal alerts consumers when placing off-net calls. Yet, such mechanisms generate costs on their own, and they are often considered a nuisance by many consumers.

An alternative method to avoid the customer ignorance problem would be the introduction of the so called *receiving party pays regime* (RPP), as in the United States, in Canada and some Asian countries. Since under RPP the calling party is charged for the origination but not for the termination of off-net calls, tariff transparency becomes irrelevant. That is, under RPP, the customer ignorance problem vanishes.

# 4 Charges for MNP

We have argued that there are various costs and benefits of introducing MNP. However, virtually all cost-benefit analyses have concluded that the overall effect of MNP on welfare is likely to be positive. Since MNP is not costless, at least two questions remain: Who should pay for MNP? And what is the efficient charge for porting a number? In the following subsections, we discuss potential answers to these questions.

## 4.1 Inefficiency of Free Porting

Economic efficiency typically requires that users of a given resource or service pay for their usage if the resource under consideration is scarce (i.e. carries an opportunity cost). If users are not made to pay even though their usage causes costs, an inefficient over-use of the resource will result. This problem is also known as the "tragedy of the commons". More generally, a below-cost usage fee leads to inefficiencies. Making a resource available free of charge is thus only efficient if it is either not scarce or a public good, where the latter is characterized by two distinctive features:

(a) It is economically not feasible to exclude people from using a good or service (non-excludability); and

(b) Additional users do not cause additional costs (non-rivalry in use).

It should be clear that MNP is not a (pure) public good, as (a) people unwilling to pay for MNP can be excluded and (b) additional portings cause additional costs, i.e. the incremental cost of an additional porting is positive.

However, as we have seen, there are various benefits associated with MNP, some of which are private and some of which are public. While type 1A and 1B benefits are private, type 2 and 4 benefits resulting from the strengthening of competition and increased investment incentives are public, as they do not only accrue to those users who actually port their

number. In particular, it is not possible to exclude any user from the competitive benefits that arise from the introduction of MNP. Moreover, type 2 and 4 benefits do not actually arise from porting a number, but from the *option* to do so. The possibility to port one's number strengthens users' positions vis-à-vis their provider, and this possibility is decisive for competition.[10]

Existing cost-benefit-analyses suggest that type 1A and 1B benefits are at least as large as type 2 benefits. Furthermore, type 2 benefits are expected to be the smaller the more competitive a particular market was before introducing MNP. Hence, at least in highly competitive markets the benefits of MNP will be largely private, while in less competitive markets the benefits are more likely to be contain public benefits.

While private benefits and positive incremental costs per porting call for positive charges, there are also positive externalities to be considered. These are the benefits to potential callers, i.e. type 3 benefits. On the other hand, there are negative externalities, as MNP can reduce tariff transparency. We think that neither the positive nor the negative externalities should be overemphasized, as their magnitude has not been estimated to be significant. From this, we conclude that making MNP available free of charge will be inefficient: Free porting will induce users to port their number even if their number's valuation is smaller than the incremental cost of porting. Therefore, an avoidable deadweight loss will result.

Furthermore, MNP can be viewed as a new service offered to consumers. In a perfectly competitive market, new services will be offered if providers expect the total revenues from these services to cover the costs. Hence, even in a perfectly competitive environment, MNP would not be offered free of charge, but at a positive price. Accordingly, donor and/or recipient networks should be allowed to charge for porting.

## 4.2 Regulating Charges for MNP

The next step is to look for an efficient charge for porting a number. Economic intuition suggests that market forces are unlikely to lead to efficient charges for captured customers, as the respective operators are the only providers of MNP for their customers and thus enjoy monopoly power. Note that most customers have received their mobile telephone number well before MNP has been introduced.

The picture is less somber for new customers, where the porting charge is just one element of the service packages offered by the different providers. Here, it is conceivable that providers voluntarily offer MNP at efficient prices so as to convince consumers to sign a contract.[11] In particular, with nonlinear tariffs, service providers have an incentive to charge efficient variable charges and extract the costumer surplus using the fixed fee. In this case, the outcome may be efficient, even though the consumer surplus is redistributed to the providers. Overall, it seems nevertheless likely that, at least in the short run, market prices for MNP are at inefficiently high levels, as mobile operators have monopoly power in setting MNP charges for the majority of their customers since MNP was not available when most customers'

---

10 Also note that users can not be excluded from the option to port their number, even if users who do not wish to pay can be excluded from actually porting the number.

11 This argument is related to Farrell and Gallini (1988) who show that producers may voluntarily commit to keep markets competitive (by opening up second sources) in order to convince consumers that they will not be exploited at a later stage.

received their current mobile telephone number.[12] This suggests that regulating the charges for MNP is desirable (at least for a transition period after introducing MNP).

For determining the efficient charge for porting a number, it is important to note that MNP has both fixed and variable costs. In particular, IN solutions are characterized by decreasing average costs. This means that determining efficient charges for MNP gives rise to similar problems as the determination of efficient charges in natural monopoly settings. It is well known from standard economic theory that the efficient price for natural monopoly services is at the marginal or incremental cost level (see, e.g. Viscusi, Vernon, Harrington, 2000). The resulting deficit should ideally be compensated through government subsidies. Hence, one could argue that porting charges should be set at incremental or variable cost and the government should cover the fixed cost associated with the development and implementation of mandatory MNP.[13]

One might be tempted to argue that the operators should bear the fixed cost and set prices at incremental costs in order to guarantee allocative efficiency if the government is not willing to cover the fixed cost. However, this solution distorts the operators' choice of technology: If operators are forced to cover the fixed cost and the technology is not predetermined, operators are likely to choose a technology with relatively low fixed and high variable costs (such as an on-switch solution), which may lead to productive inefficiencies. That is, providers may deliberately install an inefficient technology with relatively high variable costs, attempting to recover a larger part of the total cost from MNP. In addition, higher MNP charges imply higher consumer switching costs. This again allows incumbent providers to charge less aggressively without losing their current customers. Hence, incumbent providers are likely to set rather high MNP charges in order to avoid losing customers.

To avoid this problem, regulatory authorities could prescribe the technology to be used. However, this approach is unlikely to give rise to an efficient outcome, as operators typically have better information about the efficient use of technologies than regulators. It is well known from principal-agent analysis that the regulator (the principal) has to reward the operators (the agents) to induce an efficient technology choice in the presence of asymmetric information. If operators anticipate that they will have to lower their porting charges if they use an efficient instead of an inefficient technology, an inefficient technology will result. An obvious way to provide incentives is a price cap regulation for porting charges. As a starting point, one may use current average cost, but also some other figure exceeding incremental cost (to avoid the over-use problem). To avoid potential "gold plating" by operators, one may use a ceiling for the average cost, based on the most efficient technology in use today.

There are essentially two arguments in favor of a price cap regime starting from current average costs. First, such a regime leads to efficient "make or buy" decisions: If operators are allowed to recover variable costs only, they may strategically outsource parts of their business in order to substitute variable for fixed costs. Since an external provider of MNP-related services will charge a price for its services that at least covers average cost, mobile operators

---

12 It should thus not come as a surprise that the German regulatory authority (RegTP) felt it had to step in and to regulate charges for MNP ex post after two small service providers decided to charge their customers a price of 116.00 € for porting their number (see http://www.regtp.de/aktuelles/pm/03140/index.html). Most other European countries have regulated MNP charges ex ante.

13 Introducing two-part tariffs for MNP is not very useful, as most consumers have only one mobile number to port (i.e., one unit of consumption). Alternatively, one might consider a tariff involving a (fixed) fee for buying an *option* to port one's number and another charge when exercising this option (the incremental cost of porting). Note, however, that it is virtually impossible to install different technologies for different customers on the same network. Hence, in practice, the MNP *option* can only be installed jointly for all customers and it is not possible to exclude consumers from this option.

will outsource excessively in order to reduce their fixed cost (if they cannot recover them through MNP fees). In contrast, under a price cap regime starting from current average costs, operators will only outsource if an external provider of MNP services can offer these services at lower prices than the corresponding costs of in-house production. Second, starting from current average costs allows operators to implement MNP without incurring losses. If, instead, operators are forced to offer MNP at prices below average cost, this will be regarded as a government hold-up or expropriation. Since license fees, network investments and customer acquisition costs are all specific investments, operators are vulnerable to expropriation through renegotiation of the regulatory contract (see Goldberg, 1976; Sidak and Spulber, 1997). In dynamic and innovative industries such as mobile communications, dynamic efficiency aspects are highly relevant. Therefore, regulators should be hesitant to introduce regulations adversely affecting investment and innovation incentives.

Summing up, we argue that the market is unlikely to generate efficient charges for MNP, as service providers have monopoly power over their captured customers, as MNP became available after most consumers had been allocated a mobile number. Regulating the charges for MNP thus seems desirable (at least in a transition period after introducing MNP), provided that the regulated charges cover not only the variable costs, but also parts of the fixed costs (a) in order to avoid an ex post hold-up which adversely affects investment incentives and (b) to provide incentives to implement an efficient MNP technology. We argue that a price cap regime starting from the current average cost of the most efficient technology in use should be expected to provide appropriate incentives.

# 5 The European Experience

As noted at the outset, the EU's Universal Service Directive requires member states to implement number portability for publicly available telephone services (including mobile services). The provision of number portability should be cost oriented and charges should not prevent subscribers from porting their numbers. The implementation of MNP may be abandoned if it either leads to negligible positive effects for end-users and competition or is technically non-feasible. The directive furthermore stresses the importance of transparent tariff information and instructs NRA's to facilitate tariff transparency when implementing number portability.

We now review the introduction of MNP and its success in European countries and abroad. In particular, we focus on the actual use of MNP, porting charges, porting speeds and regulatory interventions to foster price transparency for off-net-calls.[14]

## 5.1 Introduction of MNP

In 1997, Singapore was the world's first country to implement (limited)[15] MNP. The United Kingdom and the Netherlands first implemented MNP in Europe in 1999. Countries such as Spain (2000), Sweden and Denmark (all 2001), Belgium, Italy, Germany and Portugal (all 2002) followed suit. Most recently, Estonia implemented MNP due to regulatory intervention. Only few EU member states have not yet introduced MNP (see Table 2).

---

14 We have surveyed European regulatory authorities in fall 2003 with respect to regulatory frameworks and their first experiences with MNP. In the following, we present some of this survey's results.

15 Even though implemented in 1997, MNP has been limited to voice telephony without the ability to support data services such as SMS and MMS.

Table 2: Introduction of MNP in Europe

| Year | Countries |
|---|---|
| 1997 | Singapore |
| 1999 | UK, Netherlands, Hong Kong |
| 2000 | Spain, Switzerland |
| 2001 | Sweden, Denmark, Norway, Australia |
| 2002 | Belgium, Italy, Germany, Portugal |
| 2003 | Finland, Luxembourg, Ireland, France |
| 2004 | Greece, Austria, Slovenia, Cyprus, Lithuania, Poland, Hungary, USA, South Korea |
| 2005 | Estonia, Latvia (planned) , Malta (31 July 2005) |
| Not clear | Czech Republic, Slovakia, New Zealand, Japan, Mexico |

Sources: Own inquiries, EEC (2004).

Table 3: Delays in Implementing MNP

| Country | Original plan | Date started | Time lag (months) | Reason |
|---|---|---|---|---|
| Austria | Aug-2003 | Oct-2004 | 15 | Opposition of large MNOs |
| Czech Republic | 2004 | Not known | Not known | Not known |
| France | Jan-2001 | Jun-2003 | 30 | Not known |
| Germany | 1997 | Nov-02 | 60 | Awaiting international standards<br>Public consultations<br>Time needed to design solution |
| Ireland | Nov-02 | Jul-03 | 9 | Lack of co-operation due to resources being deployed in the transition to the Euro<br>Emphasis on full automation and very fast porting times leading to complex specifications. |
| The Netherlands | Dec-98 | Apr-99 | 4 | Technical issues |
| UK | Jul-98 | Jan-99 | 6 | Technical issues |

Source: Ovum (2005), own inquiries.

The widespread implementation of MNP in Europe thus took about six years. A number of countries postponed the implementation of MNP for various reasons. For instance, Germany delayed the introduction of MNP due to the lack of an adequate technical solution. Also, Austria postponed the introduction of MNP several times (see Table 3): While smaller Austrian operators such as *tele.ring* and *Tele2* supported MNP, the larger operators *mobilkom* and *T-Mobile* had reservations about MNP.[16] Similar delays occurred in Non-European

16 See http://www.heise.de/newsticker/meldung/45307 (18 June 2004).

countries such as Australia, where MNP started with a delay of no less than 50 months (see Ovum, 2005).

## 5.2 The Use of MNP

It should be clear that the actual use of MNP is crucial for its impact. Since MNP lowers switching costs, churn rates should be expected to increase, thereby intensifying competition. Unfortunately, there are no statistics on churn rates available for most European countries. We therefore focus on the number of portings as a proxy for the success of MNP.[17] Table 4 illustrates that the use of MNP differs widely across countries. In the UK, in Spain and in Italy, more than two million numbers were ported during the last few years. In countries such as Germany and France, however, relatively few subscribers ported their numbers. In terms of percentages of subscribers, Finland, Denmark, and the Netherlands show the highest numbers.

Table 4: Ported Numbers in European Countries

| Country | Period | Ported Numbers | Avg. ported numbers (monthly) | Percentage of all subscribers |
|---|---|---|---|---|
| UK | 1/1999 - 8/2004 | 3036863 | 44659.75 | 5.6 |
| Italy | 5/2002 - 8/2004 | 2500000 | 89285.71 | 4.5 |
| Spain | 12/2002 - 8/2004 | 2091515 | 99595.95 | 5.5 |
| Finland | 7/2003* - 8/2004 | 993578 | 76429.07 | 20.8 |
| Netherlands | 4/1999 - 8/2004 | 925343 | 17459.30 | 6.9 |
| Denmark | 7/2001 - 8/2004 | 918000 | 35307.69 | 17.8 |
| Belgium | 10/2002 - 8/2004 | 500408 | 21756.86 | 6.2 |
| Sweden | 9/2001 - 8/2004 | 486936 | 13526.00 | 5.6 |
| Germany | 11/2002 - 8/2004 | 349000 | 15863.63 | 0.6 |
| Ireland | 7/2003* - 8/2004 | 142414 | 10954.92 | 4.1 |
| Lithuania | 1/2004 - 8/2004 | 130000 | 16250.00 | n.a. |
| France | 7/2003 - 8/2004 | 100000 | 7142.85 | 0.2 |
| Portugal | 1/2002 - 8/2004 | 35032 | 1094.75 | 0.4 |
| Hungary | 5/2004 - 8/2004 | 13875 | 3468.75 | n.a. |
| Cyprus | 7/2004** - 8/2004 | 98 | 65.33 | <0.1 |

Source: EEC (2004), own inquiries. *25 July 2003, **12 July 2004

Since many European countries have introduced MNP only recently, it is difficult to predict future adoption processes.. Furthermore, because of different introductory dates and considerable heterogeneity among the countries, it is no trivial task to compare the number of portings. Many variables such as contract periods, competitive environments, and switching costs affect the decision to use MNP services. A crucial factor, however, should be the price

17 Note, however, that there may also be an overuse of MNP if porting charges are too low as argued above.

for porting numbers. As charges for porting mobile numbers strongly vary across countries, price differentials might be an adequate explanation.

### 5.3 Charges for Porting: Regulatory Frameworks and Empirical Evidence

The EU's Universal Service Directive requires that charges for porting mobile numbers are cost oriented, and most member states have thus implemented regulations that should prevent porting charges to exceed costs. Nevertheless, the extent to which these charges are cost oriented is difficult to assess, since the evaluation of costs is a daunting task. If mobile operators use IN-solutions with high set-up costs, for example, uncertainty about the future number of portings could lead to a serious misinterpretation of costs. In particular, underestimating the number of future portings would lead to charges above costs.

Our survey indicates that in many countries, either the donor network (as, e.g., in Sweden) or the recipient network (as in Finland, Italy, and Norway) is allowed to charge fees for this service. A typical situation is that the recipient network charges a fee to the customer's account and, simultaneously, the donor network charges a fee to the recipient network's account. In Finland, for example, operators are allowed to charge fees to the switching customers, and maximum fees are not regulated. However, number porting is typically free in practice, due to the competitive situation in Finland. Irish and Spanish operators, in contrast, are not allowed to set charges that can be a disincentive to porting numbers. Table 5 summarizes the various regulatory frameworks in European countries.

Table 5: Regulation of One-time Charges for Porting Mobile Numbers

| **Country** | **Permission of charging fees?** | **Regulation of maximum fee?** | **Basis** |
|---|---|---|---|
| Austria | YES | Max. €19 | - |
| Belgium | YES - Only recipient network is allowed to charge fees. | Max. €15 | Cost oriented |
| Denmark | YES - Customers pay typically the fee that operators charge to their competitors. | NO | Cost oriented |
| Germany | YES | A unique fee based on the costs caused by porting numbers. | Cost oriented |
| Finland | YES - Only recipient network is allowed to charge fees. | NO | Cost oriented |
| Greece | YES | - | - |
| Ireland | YES - Charges shall not be an disincentive for users to port their number | Charges shall not be an disincentive for users to port their number | Cost oriented |
| Italy | YES - Only recipient network is allowed to charge fees. | Max. €10.02 | - |
| Netherlands | YES - Only recipient network is allowed to charge fees. Charge shall | Max. €9 | - |

| | | | |
|---|---|---|---|
| | not exceed administrative costs. | | |
| Norway | YES - Only recipient network is allowed to charge fees. | NO | Charge between networks should cover costs of donor network. |
| Portugal | YES | NO | - |
| Sweden | YES - Only donor network is allowed to charge fees. | NO (to customer) YES (donor to recipient) | Cost oriented (administrative and porting costs) |
| Switzerland | YES | NO | - |
| Spain | YES | Charges shall not be an disincentive for users to port their number. | - |
| UK | YES | "adequate fees" | Marginal costs |

Source: Own inquiries.

As can be seen from Table 6, there are a number of countries where networks do not charge customers for porting numbers. For instance, in addition to Finland, MNP is typically free in the UK and in Ireland. In Belgium, only pre-paid subscribers pay for porting their mobile number. German operators charge between €22.50 and €29.95, whereas networks charge between €9 and €24 in other countries.

Table 6: Charges for Porting Mobile Numbers

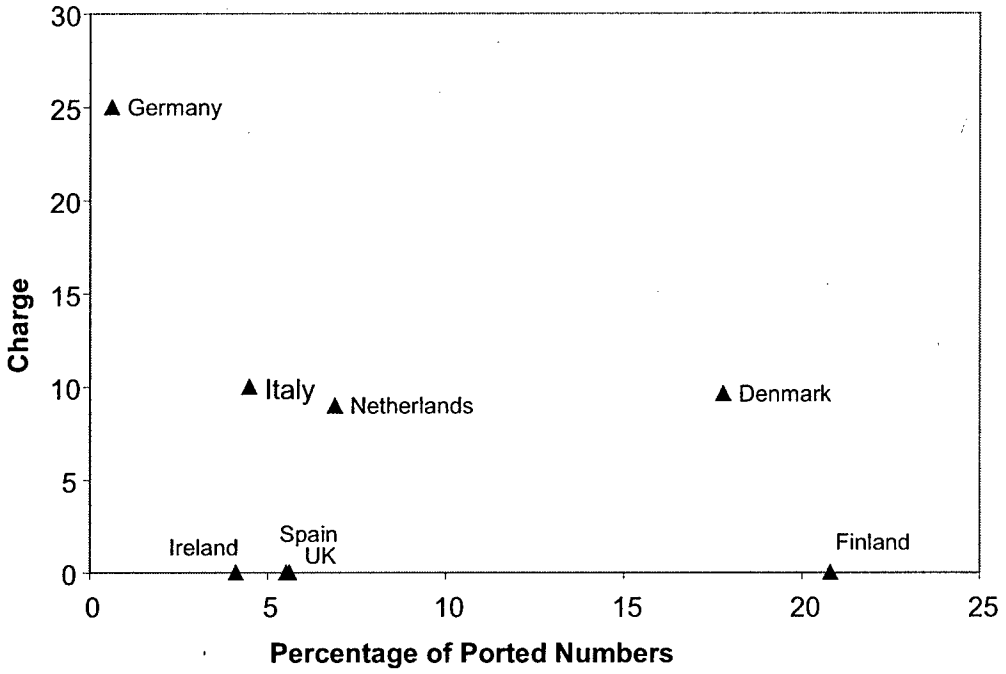
| **Country** | **Fee** |
|---|---|
| Austria | Recipient network charges €4-15. |
| Belgium | Only pre-paid but not post-paid customers are charged for porting mobile numbers. |
| Denmark | Operators committed to charge €9.60 per ported number to customers. The donor operator charges the same amount to the new operator. |
| Germany | *O2* charges €22.50 and *T-Mobile*, *Vodafone* and *E-Plus* charge €24.95 to their customers. Some small service providers charge €29.95. |
| Finland | The donor network charges about €5-10 to the recipient operator. No fees for customers. |
| Ireland | No fees for Customers. |
| Italy | The donor operator charges €10.02 to the recipient operator. No fees for Customers. |
| Netherlands | The recipient operator is allowed to charge the customer €9. Charges consist of administrative fees. |
| Sweden | Only donor operators charge €4-24 fees to the recipient operator. |
| Spain | No fees. |
| UK | Typically no fees. Some operators charge £25. |

Source: Own inquiries.

Relating the actual use of MNP (measured by the percentage of ported numbers) to the relevant charges yields ambiguous results: In some countries with free porting (Ireland, Spain and UK) only a moderate number of portings occurs, whereas Finland shows a high number (see Figure 2). Moreover, German operators seem to have set nearly prohibitively high charges. Overall, there appears to be a negative relation between porting fees and the number

of portings (in percent of all numbers). Higher charges tend to lead to higher consumer switching costs and therefore to a lower use of MNP.

Figure 2: Comparison of Charges and Portings




## 5.4 Speed of Porting

During the porting process, the ported number cannot handle incoming or outgoing calls. Therefore, increasing the speed of porting is crucial for fostering the use of MNP. Porting time depends both on the technical porting systems and on the willingness of networks to speed up the porting process. Typically, neither the donor nor the recipient network have strong incentives to quickly resolve technical problems in porting, as it is less costly to let the other networks look for a solution.[18] A further obstacle to rapid porting is the notice period. Subscribers must wait until the notice period in their contract expires before the donor network releases the number.[19]

Table 7 illustrates that the speed of porting is heterogeneous across countries. While in some countries porting time is extremely short—porting takes only two and a half hours in the US—operators from other countries may need days, weeks or even months to port a number (see Ovum, 2005). Porting time has also varied considerably over time. While many countries have partly used manually operated porting processes in the beginning of MNP, nowadays most countries have installed automated porting systems. Although, porting time has been reduced considerably, there are still obstacles to rapid porting. In the UK, for instance, porting processes are donor led. Since the donor network has little incentive to speed up porting, this is likely to delay porting. In Germany, subscribers are not allowed to terminate contracts and

18 In particular, the donor network has little to gain from speeding up the process.

19 In Germany, for example, subscribers have to inform the donor network about their intention to port a mobile number about 2 weeks before the contract expires.

port their numbers when the contract has not yet expired. In the Netherlands, roughly 60% of porting requests are not successful because of invalid customer information (see Ovum, 2005).

Table 7: Speed of Porting

| Country | Speed of porting | Porting process |
|---|---|---|
| Australia | 3 hours, 2005 | Via recipient |
| Austria | 3 days | Via recipient |
| Germany | 6 days, 2005 | Via recipient |
| Hong Kong | 36 hours, 2005<br>48 hours, 2001 | Via recipient |
| Italy | 15 days, 2003 | - |
| Ireland | 2 hours, 2005 | Via recipient |
| Netherlands | 4 days, 2005<br>3-12 weeks, 2004<br>2 month, 1999 | Via recipient |
| UK | 5-7 days, 2005<br>1 month, 1999 | Via donor |
| USA | 2 ½ hours, 2005 | - |

Sources: Ovum, 2005; Syniverse Technologies, 2004 and Wind, 2003.

## 5.5 Tariff Transparency

As we noted above, once MNP is implemented, the prefix of a mobile number no longer indicates the network of a subscriber, and consumers may thus be unaware of exact charges for calls.[20] As a consequence, introducing MNP reduces tariff transparency. For this reason, the EU's Universal Service Directive stresses the importance of transparent tariff information and instructs NRA's to facilitate tariff transparency when implementing number portability.

There are different options to increase tariff transparency in the presence of MNP. Customers may be informed by enquiry numbers or SMS services to learn about the network of a given number. Acoustic signals may alert subscribers when placing off-net calls, or verbal announcements could inform about tariffs when calling to different networks. Table 8 summarizes the methods used in European countries. In Finland, consumers can call a toll-free number to learn about subscribers' network association. In Germany, toll-free numbers and a toll-free SMS service is available. In Portugal, Ireland and Belgium, consumers are informed by an acoustic signal when placing off-net calls. Consequently, users are informed that they are placing an off-net call, but they do not learn the price of the call. Obviously, a better system would inform subscribers about prices when placing their calls.

20 Recall that this problem arises only when the so called calling-party-pays regime applies as in most European countries.

Table 8: Methods of Carrier Identification

| Country | Method |
|---|---|
| Austria | Verbal announcement |
| Belgium | Acoustic signal when placing off-net calls |
| Finland | Toll-free enquiry numbers |
| Germany | Toll-free enquiry numbers and toll-free SMS Service |
| Ireland | Acoustic signal when placing off-net calls |
| Portugal | Acoustic signal when placing off-net calls |

Sources: Own inquiries

# 6 Summary and Conclusions

We have argued that the rationale of introducing MNP is simple: It is expected to eliminate or at least reduce the costs of switching providers, making mobile telecommunications more competitive and thus bringing about considerable gains to consumers of mobile services. Even though there are both direct and indirect costs of introducing MNP (including reduced tariff transparency), virtually all cost-benefit-studies have concluded that the overall effect of MNP is positive. Interestingly, none of these studies has focused on the question of how to best charge for porting a mobile number. We have argued that a price cap regime starting from the current average cost of porting a number provides appropriate incentives for operators.

Our review of the experience with MNP in Europe indicates that the regulatory frameworks for MNP and its actual use vary considerably across Europe. In countries such as Finland or Denmark, a large number of subscribers have already ported their mobile number, whereas in other countries, including Germany, France and Italy, relatively few subscribers have ported their number. To some extent, this may be explained by the differences in (i) charges for porting numbers, and (ii) the speed of porting.

# References


Aoki, R., Small, J. (1999), The Economics of Number Portability: Switching Costs and Two-Part Tariffs, Working Paper, University of Auckland, November 1999.

BBC (2003), China's Lucky Phone Number, online at: http://news.bbc.co.uk/1/hi/world/asia-pacific/3163951.stm

Buehler, S., Haucap, J. (2004), Mobile Number Portability, *Journal of Industry, Competition and Trade* 4, 223-228.

Dewenter, R., Haucap, J. (2005), The Effects of Regulating Mobile Termination Rates for Asymmetric Networks, forthcoming in: *European Journal of Law and Economics* 20.

EEC (2004), European Electronic Communications Regulations and Markets 2004, 10th Report Annex 3, Commission Staff Working Paper, Brussels 2.12.2004.

European Parliament (2002), Directive 2002/22/EC of the European Parliament and of the Council of 7 March 2002 on universal service and users' rights to electronic communications networks and services.

Farrell, J., Gallini, N. (1988,), Second-sourcing as Commitment: Monopoly Incentives to Attract Competition, *Quarterly Journal of Economics* 103, 673-694.

Farrell, J., Shapiro, C. (1988,), Dynamic Competition with Switching Costs, *RAND Journal of Economics* 19, 123-137.

Fudenberg, D., Tirole, J. (1984), The Fat-Cat Effect, the Puppy-Dog Ploy and the Lean and Hungry Look, *American Economic Review* 74, 361-368.

Galbi, D.A. (2001), Regulating Prices for Shifting Between Service Providers, *Information Economics and Policy* 13, 181-198.

Gans, J.S., King, S.P. (2000), Mobile Network Competition, Customer Ignorance and Fixed-to-Mobile Call Prices, *Information Economics and Policy* 12, 301-328.

Gans, J.S., King, S.P. (2001), Regulating Endogenous Customer Switching Costs, *Contributions to Theoretical Economics* 1, No. 1, Article 1. http://www.bepress.com/bejte/contributions/vol1/iss1/art1

Gans, J.S., King, S.P., Woodbrige, G. (2001), Numbers to the People: Regulation, Ownership, and Local Number Portability, *Information Economics and Policy* 12, 301-327.

Goldberg, V.P. (1976), Regulation and Administered Contracts, *Bell Journal of Economics* 7, 426-448.

Grossman, S.J., Hart, O. (1986), The Cost and Benefits of Ownership: A Theory of Vertical and Lateral Integration, *Journal of Political Economy* 94, 691-719.

Haucap, J. (2003), Telephone Number Allocation: A Property Rights Approach, *European Journal of Law and Economics* 15, 91-109.

Klemperer, P. (1987a), Markets with Consumer Switching Costs, *Quarterly Journal of Economics* 102, 375-394.

Klemperer, P. (1987b), The Competitiveness of Markets with Switching Costs, *RAND Journal of Economics* 18, 139-150.

Klemperer, P. (1988), Welfare Effects of Entry into Markets with Switching Costs, *Journal of Industrial Economics* 37, 159-165.

Klemperer, P. (1995), Competition When Consumers Have Switching Costs: An Overview with Applications to Industrial organization, Macroeconomics, and International Trade, *Review of Economic Studies* 62, 515-539.

NERA/Smith (1998), Feasibility Study and Cost Benefit Analysis of Number Portability for Mobile Services in Hong Kong, Final Report OFTA, NERA/Smith, London.

Oftel (1997), Economic Evaluation of Number Portability in the UK Mobile Telephoney Market, Oftel: London.

Ovum (2000), Mobile Numbering and Number Portability in Ireland, A Report to the ODTR, Ovum: London.

Ovum (2005), Mobile Number Portability – An International Benchmark, A Report to MTN, Ovum Project CLM42, Ovum: London.

Schwarz-Schilling, C., Stumpf, U. (1999), Netzbetreiberportabilität im Mobilfunk: Auswirkungen auf Wettbewerb und Verbraucherinteressen, Discussion Paper No. 199, WIK: Bad Honnef.

Sidak, J.G., Spulber, D.F. (1999), *Deregulatory Takings and the Regulatory Contract: The Competitive Transformation of Network Industries in the United States*. MIT Press.

Smith/Arcome/NERA (1997), Technical Options and Costs for Achieving Number Portability, Final report for the European Commission, Brussels.

Syniverse Technologies (2004), A Global Perspective on Number Portability, Syniverse Technologies Inc.

Viard, V.B. (2004), Do Switching Costs Make Markets More or Less Competitive?: The Case of 800-Number Portability, Stanford Graduate School of Business Research Paper Series Paper No. 1773(R1). http://ssrn.com/abstract=371921

Viscusi, K., Vernon, J., Harrington, J.E. (2000): *Economics of Regulation and Antitrust.* 3rd edition, MIT-Press, Cambridge, MA.

Wind (2003), Mobile Number Portability, WIND Telecommunications – Media Relations.

Wright, J. (2002), Access Pricing under Competition: An Application to Cellular Networks, *Journal of Industrial Economics* 50, 289-315.

**Bisher erschienen:**

**Diskussionspapiere der Fächergruppe Volkswirtschaftslehre**

- Bühler, Stefan, Ralf Dewenter & Justus Haucap, Mobile Number Portability in Europe, No. 41 (August 2005).
- Meyer, Dirk, Manuskriptstaus behindern den Wissenschaftsbetrieb: Zur Möglichkeit von Einreichungsgebühren, Autorenhonoraren und Gutachterentgelten, Nr. 40 (Juni 2005).
- Carlberg, Michael, International Monetary Policy Coordination, No. 39 (March 2005).
- Zimmermann, Klaus W. & Reto Schemm-Gregory, Eine Welt voller Clubs, Nr. 38 (März 2005), erscheint in: *Zeitschrift für Wirtschaftspolitik.*
- Hackmann, Johannes, Die Bestimmung der optimalen Bevölkerungsgröße als (wirtschafts-) ethisches Problem, Nr. 37 (März 2005).
- Josten, Stefan Dietrich, Middle-Class Consensus, Social Capital and the Mechanics of Economic Development, No. 36 (January 2005).
- Dewenter, Ralf & Ulrich Kaiser, Anmerkungen zur ökonomischen Bewertung von Fusionen auf dem Printmedienmarkt, Nr. 35 (Januar 2005).
- Göbel, Markus & Tobias Thomas, Informal Institutions and the "Weaknesses" of Human Behavior, No. 34 (January 2005).
- Dewenter, Ralf & Justus Haucap, Estimating Demand Elasticities for Mobile Telecommunications in Austria, No. 33 (Dezember 2004).
- Meyer, Dirk, Die Entmachtung der Politik: Zur Frage der Überlebensfähigkeit demokratischer Nationalstaaten in einer globalisierten Weltwirtschaft, Nr. 32 (Dezember 2004).
- Josten, Stefan Dietrich & Klaus W. Zimmermann, Unanimous Constitutional Consent and the Immigration Problem, No. 31 (Dezember 2004), erscheint in: *Public Choice.*
- Bleich, Torsten, Importzoll, Beschäftigung und Leistungsbilanz: ein mikrofundierter Ansatz, Nr. 30 (September 2004).
- Dewenter, Ralf, Justus Haucap, Ricardo Luther & Peter Rötzel, Hedonic Prices in the German Market for Mobile Phones, No. 29 (August 2004).
- Carlberg, Michael, Monetary and Fiscal Policy Interactions in the Euro Area, No. 28 (März 2004).
- Dewenter, Ralf & Justus Haucap, Die Liberalisierung der Telekommunikationsbranche in Deutschland, Nr. 27 (März 2004), erschienen in: *Zeitschrift für Wirtschaftspolitik* 53, 2004, 374-393.
- Kruse, Jörn, Ökonomische Konsequenzen des Spitzensports im öffentlich-rechtlichen und im privaten Fernsehen, Nr. 26 (Januar 2004).
- Haucap, Justus & Jörn Kruse, Ex-Ante-Regulierung oder Ex-Post-Aufsicht für netzgebundene Industrien?, Nr. 25 (November 2003), erschienen in *Wirtschaft und Wettbewerb* 54, 2004, 266-275.

- Haucap, Justus & Tobias Just, Der Preis ist heiß. Aber warum? Zum Einfluss des Ökonomiestudiums auf die Einschätzung der Fairness des Preissystems, Nr. 24 (November 2003), erschienen in *Wirtschaftswissenschaftliches Studium* (*WiSt*) 33 (9), 2004, 520-524.
- Dewenter, Ralf & Justus Haucap, Mobile Termination with Asymmetric Networks, No. 23 (October 2003), erscheint in: *European Journal of Law and Economics* 20, 2005.
- Dewenter, Ralf, Raising the Scores? Empirical Evidence on the Introduction of the Three-Point Rule in Portugese Football, No. 22 (September 2003).
- Haucap, Justus & Christian Wey, Unionisation Structures and Innovation Incentives, No. 21 (September 2003), erschienen in: *The Economic Journal* 114, 2004, C145-C165.
- Quitzau, Jörn, Erfolgsfaktor Zufall im Profifußball: Quantifizierung mit Hilfe informationseffizienter Wettmärkte, Nr. 20 (September 2003).
- Reither, Franco, Grundzüge der Neuen Keynesianischen Makroökonomik, Nr. 19 (August 2003), erschienen in: *Jahrbuch für Wirtschaftswissenschaften* 54, 2003, 131-143.
- Kruse, Jörn & Jörn Quitzau, Fußball-Fernsehrechte: Aspekte der Zentralvermarktung, Nr. 18 (August 2003).
- Bühler, Stefan & Justus Haucap, Mobile Number Portability, No. 17 (August 2003), erschienen in: *Journal of Industry, Competition and Trade* 4, 2004, 223-238.
- Zimmermann, Klaus W. & Tobias Just, On the Relative Efficiency of Democratic Institutions, No. 16 (July 2003).
- Bühler, Stefan & Justus Haucap, Strategic Outsourcing Revisited, No. 15 (July 2003), erscheint in *Journal of Economic Behavior and Organization*, 2005.
- Meyer, Dirk, Die Energieeinsparverordnung (EnEV) - eine ordnungspolitische Analyse, Nr. 14 (Juli 2003).
- Zimmermann, Klaus W. & Tobias Thomas, Patek Philippe, or the Art to Tax Luxuries, No. 13 (June 2003).
- Dewenter, Ralf, Estimating the Valuation of Advertising, No. 12 (June 2003).
- Otto, Alkis, Foreign Direct Investment, Production, and Welfare, No. 11 (June 2003).
- Dewenter, Ralf, The Economics of Media Markets, No. 10 (June 2003).
- Josten, Stefan Dietrich, Dynamic Fiscal Policies, Unemployment, and Economic Growth, No. 9 (June 2003).
- Haucap, Justus & Tobias Just, Not Guilty? Another Look at the Nature and Nurture of Economics Students, No. 8 (June 2003).
- Dewenter, Ralf, Quality Provision in Interrelated Markets, No. 7 (June 2003).
- Bräuninger, Michael, A Note on Health Insurance and Growth, No. 6 (June 2003).
- Dewenter, Ralf, Media Markets with Habit Formation, No. 5 (June 2003).
- Haucap, Justus, The Economics of Mobile Telephone Regulation, No. 4 (June 2003).

- Josten, Stefan Dietrich & Achim Truger, Inequality, Politics, and Economic Growth. Three Critical Questions on Politico-Economic Models of Growth and Distribution, No. 3 (June 2003).
- Dewenter, Ralf, Rational Addiction to News?, No. 2 (June 2003).
- Kruse, Jörn, Regulierung der Terminierungsentgelte der deutschen Mobilfunknetze?, Nr. 1 (Juni 2003).

**Frühere Diskussionsbeiträge zur Wirtschaftspolitik**

- Bräuninger, Michael & Justus Haucap, Das Preis-Leistungs-Verhältnis ökonomischer Fachzeitschriften, Nr. 120 (2002), erschienen in: *Schmollers Jahrbuch* 123, 2003, S. 285-305.
- Kruse, Jörn, Competition in Mobile Communications and the Allocation of Scarce Resources: The Case of UMTS, Nr. 119 (2002), erschienen in: Pierrre Buigues & Patrick Rey (Hg.), *The Economics of Antitrust and Regulation in Telecommunications*, Edward Elgar: Cheltenham 2004.
- Haucap, Justus & Jörn Kruse, Predatory Pricing in Liberalised Telecommunications Markets, Nr. 118 (2002), erschienen in: Christian von Hirschhausen, Thorsten Beckers & Kay Mitusch (Hrsg.), *Trends in Infrastructure Regulation and Financing*, Edward Elgar: Cheltenham 2004, S. 43-68.
- Kruse, Jörn, Pay-TV versus Free-TV: Ein Regulierungsproblem?, Nr. 117 (2002), erscheint in: Mike Friedrichsen (Hg.), *Kommerz - Kommunikation - Konsum. Zur Zukunft des Fernsehens in konvergierenden Märkten*, 2003.
- Kruse, Jörn, Regulierung der Verbindungsnetzbetreiberauswahl im Mobilfunk, Nr. 116 (2002), als Kurzform erschienen in: *Multimedia und Recht*, Januar 2003, S. 29-35.
- Haucap, Justus & Jörn Kruse, Verdrängungspreise auf liberalisierten Telekommunikationsmärkten, Nr. 115 (2002), erschienen in: *Perspektiven der Wirtschaftspolitik* 5, 2004, 337-361.
- Haucap, Justus & Helmmar Schmidt, Kennzeichnungspflicht für genetisch veränderte Lebensmittel: Eine ökonomische Analyse, Nr. 114 (2002), erschienen in: *Zeitschrift für Wirtschaftspolitik* 53, 2002, S. 287-316.
- Kruse, Jörn & Jörn Quitzau, Zentralvermarktung der Fernsehrechte an der Fußball-Bundesliga, Nr. 113 (2002), erschienen in: *Zeitschrift für Betriebswirtschaft, Ergänzungsheft zur Sportökonomie*, 2002, S. 63-82.
- Kruse, Jörn & Justus Haucap, Zuviel Wettbewerb in der Telekommunikation? Anmerkungen zum zweiten Sondergutachten der Monopolkommission, Nr. 112 (2002), erschienen in: *Wirtschaftsdienst* 82, 2002, S. 92-98.
- Bräuninger, Michael & Justus Haucap, What Economists Think of Their Journals and How They Use Them: Reputation and Relevance of Economics Journals, Nr. 111 (2002), erschienen in *Kyklos* 56, 2003, S. 175-197.
- Haucap, Justus, Telephone Number Allocation: A Property Rights Approach, Nr 110 (2001), erschienen in: *European Journal of Law and Economics* 15, 2003, S. 91-109.

- Haucap, Justus & Roland Kirstein, Government Incentives when Pollution Permits are Durable Goods, Nr. 109 (2001), erschienen in: *Public Choice* 115, 2003, S. 163-183.
- Haucap, Justus, Konsum und soziale Beziehungen, Nr. 108 (2001), erschienen in: *Jahrbuch für Wirtschaftswissenschaften* 52, 2001, S. 243-263.
- Bräuninger, Michael & Justus Haucap, Was Ökonomen lesen und schätzen: Ergebnisse einer Umfrage, Nr. 107 (2000), erschienen in: *Perspektiven der Wirtschaftspolitik* 2, 2001, S.185-210.
- Haucap, Justus, Uwe Pauly & Christian Wey, Collective Wage Setting When Wages Are Generally Binding: An Antitrust Perspective, Nr. 106 (2000), erschienen in: *International Review of Law and Economics* 21, 2001, S. 287-307.
- Haucap, Justus, Selective Price Cuts and Uniform Pricing Rules in Network Industries, Nr. 105 (2000), erschienen in: *Journal of Industry, Competition and Trade* 3, 2003, 269-291.
- Bräuninger, Michael, Unemployment Insurance, Wage Differentials and Unemployment, Nr. 104 (2000) erschienen in: *Finanzarchiv* 75, 2000, S. 485-501.
- Kruse, Jörn, Universaldienstlast etablierter Postunternehmen, Nr. 103 (2000) erschienen in: *Zeitschrift für Betriebswirtschaft*, Ergänzungsheft 3, 2002, S. 99-117.
- Kruse, Jörn, Sportveranstaltungen als Fernsehware, Nr. 102 (2000) erschienen in: Schellhaaß, Horst-Manfred (Hg.), *Sportveranstaltungen zwischen Liga- und Medien-Interessen*, Hofmann: Schorndorf 2000, S. 15-39.

**Frühere Diskussionsbeiträge aus dem Institut für Theoretische Volkswirtschaftslehre**

- Bräuninger, Michael, Social Capital and Regional Mobility, Nr. 4/2002.
- Schäfer, Wolf, EU-Erweiterung: Anmerkungen zum Balassa-Samuelson-Effekt, Nr. 3/2002, erschienen in: Stefan Reitz (Hg.): *Theoretische und wirtschaftspolitische Aspekte der internationalen Integration*, Duncker & Humblot: Berlin 2003, S. 89-98.
- Bräuninger, Michael, The Budget Deficit, Public Debt and Endogenous Growth, Nr. 2/2002.
- Rösl, Gerhard, Die Umverteilung der Geldschöpfungsgewinne im Eurosystem: Das Earmarking-Verfahren seit dem 1.1.2002, Nr. 1/2002, als Kurzform erschienen in: *Wirtschaftsdienst* 82, 2002, S.352-356.
- Schniewindt, Sarah, Two-Way Competition in Local Telecommunication Networks, Nr. 2/2001.
- Reither, Franco, Optimal Monetary Policy when Output Persists: On the Equivalence of Optimal Control and Dynamic Programming, Nr. 1/2001.
- Schäfer, Wolf, MOEL-Wechselkursarrangements, Nr. 1/2000, erschienen in: Günther Engel & Peter Rühmann (Hg.): *Geldpolitik und Europäische Währungsunion*, Göttingen 2000, S. 217-228.
- Heppke, Kirsten, On the Existence of the Credit Channel in Poland, Nr. 8/1999.
- Bräuninger, Michael, Unemployment and International Lending and Borrowing in an Overlapping Generations Model, Nr. 8/1999.

- Henning, Andreas & Wolfgang Greiner, Organknappheit im Transplantationswesen - Lösungsansätze aus ökonomischer Sicht, Nr. 7/1999.
- Chung, Un-Chan, East Asian Economic Crisis - What is and What Ought to be Done: The Case of Korea, Nr. 6/1999, erschienen in: *Research in Asian Economic Studies* 10, 2002, S. 93-121.
- Carlberg, Michael, Europäische Währungsunion: Der neue Policy Mix, Nr. 5/1999, erschienen in *Wirtschaftswissenschaftliches Studium (WiSt)* 29(1), 2000, S. 8-13.
- Carlberg, Michael, European Monetary Union: The New Macroeconomics, Nr. 4/1999, erschienen in: Gerhard Rübel (Hg.), *Real and Monetary Issues of International Economic Integration*, Duncker & Humblot: Berlin 2000, S. 155-175.
- Bräuninger, Michael & J.-P. Vidal, Private versus Financing of Education and Endogenous Growth, Nr. 3/1999, erschienen in: *Journal of Population Economics* 13, 2000, S. 387-401.
- Reither, Franco, A Monetary Policy Strategy for the European Central Bank, Nr. 2/1999 erschienen in: Rolf Caesar & Hans-Eckart Scharrer (Hg.), *European Economic and Monetary Union: Regional and Global Challenges*, Nomos Verlag: Baden-Baden 2001, S. 213-226.
- Bräuninger, Michael, Wage Bargaining, Unemployment and Growth, Nr. 1/1999 erschienen in: *Journal of Institutional and Theoretical Economics* 156, 2000, S. 646-660.

**Frühere Diskussionsbeiträge zur Finanzwissenschaft**

- Josten, Stefan, Crime, Inequality, and Economic Growth. A Classical Argument for Distributional Equality, 2002, erschienen in: *International Tax and Public Finance* 10, 2003, S. 435-452.
- Zimmermann, Klaus W. & Tobias Thomas, Öffentliche Güter, natürliche Monopole und die Grenze marktlicher Versorgung, 2002, erschienen in: *Wirtschaftswissenschaftliches Studium (WiSt)* 32, 2003, S. 340-344.
- Holm-Müller, Karin & Klaus W. Zimmermann, Einige Anmerkungen zur Internalisierungsstrategie mit dem produktorientierten Konzept der Pigousteuer, 2002, erschienen in: *Zeitschrift für Umweltpolitik und Umweltrecht* 25, 2002, S. 415-420.
- Josten, Stefan, Nationale Schuldenpolitik in der EWU, 2002, erschienen in: *Wirtschaftsdienst* 82, 2002, S. 219-225.
- Hackmann, Johannes, Der Sonderabgabenbezug nach dem Lebenspartnerschaftsergänzungsgesetz, 2002, erschienen in: *Wirtschaftsdienst*, 82, 2002, S. 241-248.
- Josten, Stefan, Das Theorem der Staatsschuldneutralität. Eine kritisch-systematische Rekonstruktion, 2001, erschienen in: *Jahrbuch für Wirtschaftswissenschaften* 53, 2002, S. 180-209.
- Zimmermann, Klaus W., Komplikationen und Fallstricke in der Pigou-Analyse von Externalitäten, 2001, erschienen in: *Jahrbuch für Wirtschaftswissenschaften* 53, 2002, S. 245-267
- Josten, Stefan, National Debt in an Endogenous Growth Model, 2001, erschienen in: *Jahrbuch für Wirtschaftswissenschaften* 53, 2002, S. 107-123.

- Hackmann, Johannes, Vom Ehegattensplitting zum Partnerschaftssplitting?, 2001, erschienen in: Volker Arnold (Hg.), *Wirtschaftsethische Perspektiven VI*, Schriften des Vereins für Socialpolitik 228/VI, Ducker & Humblot: Berlin 2002, S. 189-222.
- Zimmermann, Klaus W. & Tobias Just, Politische Glaubwürdigkeit und der Euro: Eine verfassungsökonomische Perspektive, 2000, erschienen in: Fritz Söllner & Arno Wilfert (Hg.), *Die Zukunft des Steuer- und Sozialstaates*, Physica Verlag 2001, S. 373-397.
- Josten, Stefan, National Debt, Borrowing Constraints, and Human Capital Accumulation in an Endogenous Growth Model, 2000, erschienen in: *FinanzArchiv* 58, 2001, S. 317-338.
- Zimmermann, Klaus W. & Tobias Just, The Euro and Political Credibility in Germany, 2000, erschienen in: *Challenge* 44, 2001, S. 102-120
- Josten, Stefan, Public Debt Policy in an Endogenous Growth Model of Perpetual Youth, 1999, erschienen in *FinanzArchiv* 57, 2000, S. 197-215.
- Zimmermann, Klaus W., Internalisierung als Nirwana-Kriterium der Umweltpolitik, 1999, erschienen in: Kilian Bizer, Bodo Linscheidt & Achim Truger (Hg.), *Staatshandeln im Umweltschutz. Perspektiven einer institutionellen Umweltökonomik*, Duncker & Humblot: Berlin 2000.
- Hackmann, Johannes, Die unterlassene Besteuerung der Nutzungswerte selbstgenutzten Wohnungseigentums: Vergebene Reformpotentiale, 1999, erschienen in: R. Lüdeke, W. Scherf & W. Steden (Hg.), *Wirtschaftswissenschaft im Dienste der Verteilungs-, Geld- und Finanzpolitik*, Festschrift für A. Oberhauser, Berlin 2000, S. 387-412.
- Zimmermann, Klaus W. & Tobias Just, Interest Groups, Referenda, and the Political Process: On the Efficiency of Direct Democracy, 1999, erschienen in: *Constitutional Political Economy* 11, 2000, S. 147-163.
- Josten, Stefan, Staatsverschuldung und Wirtschaftswachstum in einem Diamond-OLG-Modell mit AK-Technologie, 1999, erschienen in: *Jahrbuch für Wirtschaftswissenschaften* 51, 2000, S. 237-254.